SUB A1
B2

24. A method for performing ophthalmic surgery, comprising:

pulsing a laser beam at a repetition rate of at least 20 Hz;

applying said laser beam onto corneal tissue; and

scanning said pulsed laser beam in a substantially overlapping pattern on said corneal tissue.

25. The method for performing ophthalmic surgery according to claim 24, wherein:

said laser beam provides an energy level of no greater than 10 mJ per pulse to said corneal tissue.

26. The method for performing ophthalmic surgery according to claim 24, wherein:

said laser beam provides an energy level of no greater than 20 mJ per pulse to said corneal tissue.

27. The method for performing ophthalmic surgery according to claim 24, wherein:

said laser beam provides an energy level of no greater than 50 mJ per pulse to said corneal tissue.

28. The method for performing ophthalmic surgery according to claim 24, wherein:

said laser beam has a spot size on said corneal tissue of no greater than 1 mm.

29. The method for performing ophthalmic surgery according to claim 25, wherein:

said laser beam has a spot size on said corneal tissue of no greater than 1 mm.

30. The method for performing ophthalmic surgery according to claim 26, wherein:

said laser beam has a spot size on said corneal tissue of no greater than 1 mm.

31. The method for performing ophthalmic surgery according to claim 27, wherein:

said laser beam has a spot size on said corneal tissue of no greater than 1 mm.

32. The method for performing ophthalmic surgery according to claim 24, wherein:

successive pulses of said laser beam are overlapped at least 50 percent.

33. The method for performing ophthalmic surgery according to claim 24, wherein:

said laser beam is pulsed at a repetition rate

of at least 50 Hz.

34. The method for performing ophthalmic surgery according to claim 25, wherein:

said laser beam is pulsed at a repetition rate of at least 50 Hz.

35. The method for performing ophthalmic surgery according to claim 24, wherein:

said pulsed laser beam is scanned synchronously with said pulses of said laser beam.

36. The method for performing ophthalmic surgery according to claim 24, wherein:

an area of corneal tissue in a range of 0.05 to 0.5 microns deep is removed with each pulse of said laser beam.

37. The method for performing ophthalmic surgery according to claim 24, wherein:

said pulsed laser beam is scanned in circular patterns.

38. The method for performing ophthalmic surgery according to claim 24, wherein:

said pulsed laser beam is scanned in linear patterns.

39. A method for performing ophthalmic surgery, comprising:

pulsing a laser beam at an energy level of no greater than 20 mJ per pulse onto corneal tissue; and

scanning said pulsed laser beam in a substantially overlapping pattern on said corneal tissue.

40. The method for performing ophthalmic surgery according to claim 39, wherein:

said laser beam has a spot size on said corneal tissue of no greater than 1 mm.

41. The method for performing ophthalmic surgery according to claim 39, wherein:

successive pulses of said laser beam are overlapped at least 50 percent.

42. The method for performing ophthalmic surgery according to claim 39, wherein:

said laser beam is pulsed at a repetition rate of at least 20 Hz.

43. The method for performing ophthalmic surgery according to claim 39, wherein:

said laser beam is pulsed at a repetition rate of at least 50 Hz.

44. The method for performing ophthalmic surgery according to claim 39, wherein:

said pulsed laser beam is scanned synchronously with said pulses of said laser beam.

45. The method for performing ophthalmic surgery according to claim 39, wherein:

an area of corneal tissue in a range of 0.05 to 0.5 microns deep is removed with each pulse of said laser beam.

46. The method for performing ophthalmic surgery according to claim 39, wherein:

said pulsed laser beam is scanned in circular patterns.

47. The method for performing ophthalmic surgery according to claim 39, wherein:

said pulsed laser beam is scanned in linear patterns.

48. A method of performing laser ablation on tissue, said method comprising:

providing a laser having a pulsed output beam of ultraviolet wavelength;

providing a galvanometer scanner; and

controlling said pulsed output beam with said galvanometer scanner to provide a substantially overlapping random pattern of beam pulses on said tissue.

49. The method of performing laser ablation on tissue according to claim 48, wherein:

said pulsed output beam has an energy level of no greater than 10 mJ per pulse.

50. The method of performing laser ablation on tissue according to claim 48, wherein:

said pulsed output beam has an energy level of less than 20 mJ per pulse.

51. The method of performing laser ablation on tissue according to claim 48, wherein:

a pulse repetition rate of said pulsed output beam is in a range of 50 to 100 Hz.

52. The method of performing laser ablation on

tissue according to claim 48, wherein:

said laser is selected to be a diode-pumped laser.

53. The method of performing laser ablation on tissue according to claim 48, wherein:

said ultraviolet wavelength is in a range of 193 to 215 nm.

54. The method of performing laser ablation on tissue according to claim 48, wherein:

said ultraviolet wavelength is 193 nm.

55. The method of performing laser ablation on tissue according to claim 48, wherein:

said pulsed output beam has an energy level in a range of 0.05 to 10 mJ per pulse.

56. The method of performing laser ablation on tissue according to claim 48, wherein:

said pulsed output beam has an energy level of no greater than 50 mJ per pulse.

57. The method of performing laser ablation on tissue according to claim 48, wherein:

said pulsed output beam has a spot size on said tissue of no greater than 1 mm.

58. The method of performing laser ablation on tissue according to claim 55, wherein:

said pulsed output beam has a spot size on said tissue of no greater than 1 mm.

59. The method of performing laser ablation on tissue according to claim 56, wherein:

said pulsed output beam has a spot size on said tissue of no greater than 1 mm.

60. The method of performing laser ablation on tissue according to claim 48, wherein:

successive pulses of said pulsed output beam are overlapped at least 50 percent.

61. The method of performing laser ablation on tissue according to claim 48, wherein:

said pulsed output beam is pulsed at a repetition rate of at least 20 Hz.

62. The method of performing laser ablation on tissue according to claim 48, wherein:

said pulsed output beam is pulsed at a repetition rate of at least 50 Hz.

63. The method of performing laser ablation on tissue according to claim 48, wherein:

said pulsed output beam is scanned synchronously with said pulses of said pulsed output beam.

64. The method of performing laser ablation on tissue according to claim 48, wherein:

an area of corneal tissue in a range of 0.05 to 0.5 microns deep is removed with each pulse of said pulsed output beam.

65. The method of performing laser ablation on tissue according to claim 48, wherein:

said pulsed output beam is scanned in circular patterns.

66. The method of performing laser ablation on tissue according to claim 48, wherein:

said pulsed output beam is scanned in linear patterns.

67. The method of performing laser ablation on tissue according to claim 48, wherein:

said pulsed output beam is scanned in concentric circles.

68. The method of performing laser ablation on tissue according to claim 67, wherein:

said concentric circles have increasing diameters.

69. Apparatus for ablating tissue, comprising:

a laser adapted to emit a pulsed output beam of ultraviolet wavelength at a repetition rate of at least 20 Hz; and

a scanner constructed and arranged to control said pulsed beam into a substantially overlapping random pattern of beam pulses on said tissue.

70. The apparatus for ablating tissue according to claim 69, wherein:

said repetition rate is at least 50Hz.

71. The apparatus for ablating tissue according to claim 69, wherein:

said pulsed output beam has an energy level no greater than 10 mJ per pulse.

72. The apparatus for ablating tissue according to claim 69, wherein:

said scanner is constructed and arranged to

overlap adjacent beam pulses on said tissue at least 50 percent.

73. The apparatus for ablating tissue according to claim 69, wherein:

said laser has a wavelength in a range of 193 to 215 nm.

74. The apparatus for ablating tissue according to claim 69, wherein:

said laser has a wavelength of 193 nm.

75. The apparatus for ablating tissue according to claim 69, wherein:

said laser is an excimer laser.

76. An ophthalmic surgery apparatus for performing corneal refractive surgery by reshaping a portion of a corneal surface, said apparatus comprising:

a laser adapted to emit a pulsed laser beam of less than 20 mJ per pulse onto said corneal surface; and

a computer-controlled scanning device coupled to said laser to overlap pulses of said pulsed laser beam on said corneal surface to achieve a smooth ablation of corneal tissue.

77. An ophthalmic surgery apparatus for performing corneal refractive surgery by reshaping a portion of a corneal surface according to claim 76, wherein:

said smooth ablation results in a surface roughness of less than 1 micron.

78. A method of performing corneal refractive surgery by reshaping a portion of a corneal surface, said method comprising:

substantially overlapping a plurality of ultraviolet laser beam pulses over an area of a corneal surface sufficient to ablate a depth in a range of 0.05 and 0.5 microns of corneal tissue per ultraviolet laser beam pulse;

said laser beam pulses having an energy level of no greater than 20 mJ per pulse; and

said laser beam pulses having a pulse repetition rate of at least 50 pulses per second.

79. The method of performing corneal refractive surgery by reshaping a portion of a corneal surface according to claim 78, wherein:

said laser beam pulses have an energy level of no greater than 10 mJ per pulse.

80. The method of performing corneal refractive

surgery by reshaping a portion of a corneal surface according to claim 79, further comprising:

selecting a scanner to scan said overlapping plurality of laser beam pulses, said scanner deflecting said laser beam pulses a predetermined angle.

81. The method of performing corneal refractive surgery by reshaping a portion of a corneal surface according to claim 80, wherein:

said selected scanner is a galvanometer scanner.

82. An ophthalmic surgery apparatus, comprising:

a laser adapted to emit a pulsed beam of less than 20 mJ per pulse; and

a computer-controlled scanning device coupled to said laser such that pulses of said beam are substantially overlapped to achieve a smooth ablation of corneal tissue.

83. The ophthalmic surgery apparatus according to claim 82, wherein:

said pulses are overlapped in a range of 50 to 80 percent.

84. The ophthalmic surgery apparatus according to claim 82, wherein:

said laser is adapted to emit a pulsed beam of no greater than 10 mJ per pulse.

85. The ophthalmic surgery apparatus according to claim 82, wherein:

said pulsed beam has a spot size on said corneal tissue of less than or equal to 2 mm.

86. The ophthalmic surgery apparatus according to claim 82, wherein:

said laser has a repetition rate in a range of 50 and 50,000 Hz.

87. The ophthalmic surgery apparatus according to claim 82, wherein said scanning device comprises:

a galvanometer.

88. The ophthalmic surgery apparatus according to claim 87, wherein:

said repetition rate of said laser is synchronized with said galvanometer.

89. The ophthalmic surgery apparatus according to claim 82, wherein:

successive pulses of said pulsed beam are rotated through a linear-scan angle by said scanning

device.

90. A method of performing corneal refractive surgery by reshaping a portion of a corneal surface comprising:

selecting a laser having a pulsed output beam of ultraviolet wavelength and having an energy level less than 10 mJ/pulse;

selecting a scanning mechanism for scanning said laser output beam, said scanning mechanism including a galvanometer scanning mechanism for controlling said laser beam into an overlapping pattern of adjacent pulses;

coupling said laser beam to said scanning mechanism for scanning said laser beam over a predetermined surface;

focusing said scanning laser beam onto a corneal surface;

controlling said scanning mechanism to deliver the scanning laser beam in an overlapping pattern onto a plurality of positions on the corneal surface to photoablate or photocoagulate corneal tissue; and

removing from 0.05 to 0.5 microns of corneal tissue per pulse overlapped to remove tissue to a desired depth, whereby a patient's vision is corrected by the reshaping of the corneal surface of the patient's eye using a low power laser.

91. A method for performing ophthalmic surgery, comprising:

pulsing an ultraviolet laser beam;

applying said pulsing ultraviolet laser beam onto corneal tissue; and

scanning said pulsing laser beam in a purposefully substantial overlapping pattern on said corneal tissue.

92. The method of performing ophthalmic surgery according to claim 91, wherein:

said pulsing ultraviolet laser beam is pulsed at a repetition rate of at least 20 Hz.

93. The method of performing ophthalmic surgery according to claim 91, wherein:

said pulsing ultraviolet laser beam is pulsed at a repetition rate of at least 50 Hz.

94. The method of performing ophthalmic surgery according to claim 91, wherein:

said pulsing ultraviolet laser beam is sufficient to ablate a depth in a range of 0.05 and 0.5 microns of corneal tissue per pulse.

95. The method of performing ophthalmic surgery according to claim 91, wherein:

said pulsing ultraviolet laser beam provides an energy level of no greater than 10 mJ per pulse to said corneal tissue.

96. The method of performing ophthalmic surgery according to claim 91, wherein:

said ultraviolet laser beam provides an energy level of no greater than 20 mJ per pulse to said corneal tissue.

97. The method of performing ophthalmic surgery according to claim 91, wherein:

successive pulses of said ultraviolet laser beam are overlapped at least 50 percent.

98. The method of performing ophthalmic surgery according to claim 91, wherein:

successive pulses of said ultraviolet laser beam are overlapped in a range of 50 to 80 percent.

99. A method for performing photocoagulation on a corneal surface, comprising:

providing an infrared laser beam;

applying said infrared laser beam onto corneal tissue; and

scanning said infrared laser beam in a pattern to photocoagulate corneal tissue.

100. A method for performing photocoagulation on a corneal surface according to claim 100, wherein:

said infrared laser beam is emitted by a diode laser having a wavelength in a range of 1.54 to 2.5 μm.

101. A method for performing photocoagulation on a corneal surface according to claim 100, wherein:

said infrared laser beam is emitted by a diode laser having a wavelength in a range of 1.9 to 2.5 μm.

102. A method for performing photocoagulation on a corneal surface according to claim 100, wherein:

said infrared laser beam is emitted by a diode laser having a wavelength of 2.1 μm.

103. A method for performing photocoagulation on a corneal surface according to claim 100, wherein:

said infrared laser beam is emitted by a diode laser having a wavelength of 1.54 μm.

104. A method for performing photocoagulation on a corneal surface according to claim 100, wherein said infrared laser beam has a power level in a range of 10 to 100 mWatts.

ADD A15

Add B16

Add F3

Add F10

Add F16